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Remarks

Claims 1 to 24 are in this application.

Reconsideration of the Requirement for Restriction between method claims 1 to 10 and powder metal product claims 11 to 20 is requested.

Process claim 1 requires that the resulting product have a density of 99+ % of theoretical density; claim 11 requires the product to be made in accordance with claim 1; and claim 12 requires a powder metal product to have a density of 99+ % of theoretical density. The Examiner alleges that the product can be made by a materially different process, such as hot isostatic pressing. Issue is taken in this respect. The Examiner has presented no support for the allegation that a hot isostatic pressing can result in a product having a density of 99+ % of theoretical density or that "hot isostatic pressing" is materially different from the steps of "compressing the mixture at a pressure sufficient to liquefy and uniformly distribute the lubricant....; and sintering the compressed mixture ....to obtain a compressed and sintered product having a density of 99+% of theoretical density."

Accordingly, it is respectfully submitted that the product cannot be made by a materially different process from that as claimed.

Further, claim 11 is directed to a product made in accordance with the process of claim 1. This product – by – process claim by definition cannot be made by a materially different process. Accordingly, the restriction requirement at least with respect to claim 11 is not warranted.

New claims 19 to 24 have been added and are directed to a powder mixture.

The provisional election to prosecute process claims 1 to 10 (Group I) is affirmed.

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Claim 1 has been rejected as being unpatentable over Hill in view of Ozaki. Issue is taken in this respect.

Hill is directed to a product that comprises a composite mass of finely divided ferrochrome particles cemented together by a binder metal or alloy having a melting point lower than that of the ferrochrome. (column 1, lines 50 to 53). The product is made by milling together the ferrochrome and metallic binder powders. (column 3, lines 41 to 44). The resulting intimate mixture is then compacted approximately to the shape of the desired final article under a pressure of 10 to 40 tons per square inch. (column 3, lines 52 to 55). The resulting compact is then heated within a temperature range of 1850° to 2400° F so that the binder particles are converted to a totally liquid phase which substantially completely fills all of the voids or spaces between the particles of ferrochrome. (column 3, line 63 to column 4, line 3). The results in a sintered density of greater than 90% of theoretical and the material has little or no interconnected porosity. (column 4, lines 8 to 10).

Claim 1 is directed to a process that requires the step of "mixing particles of a metal powder with a lubricant. . . and at least one liquid phase former. . . ". There is no such teaching in Hill. Note that Hill teaches that if a lubricant or binder is used, it is removed before subjecting the compact to the heating step (column 3, lines 60 to 62). There is clearly no teaching in Hill of mixing a lubricant with the ferrochrome and binder and of then sintering the mixture at a sintering temperature to drive off the lubricant. Accordingly, for this reason alone, a rejection of claim 1 as being unpatentable over Hill in view of Ozaki is not warranted pursuant to the provisions of 35 USC 103.

It is noted that Ozaki is cited for teaching that a lubricant can include lauric acid. However, if a lauric acid lubricant were added to the process of Hill, the lubricant would be removed from the compact before the compact is heated to convert the binder particles to a liquid phase. This would not result in the claimed process of claim 1.

Claim 1 further requires the process to produce a compressed and sintered product "having a density of 99+% of theoretical density". Neither Hill nor Osaki describes or teaches a process to accomplish this result. Note that Hill teaches that the product produced therein has a density of greater than 90% of theoretical. However, since the binder particles fill the voids or spaces between the particles of ferrochrome, a resulting product would have a density based upon a combination of the ferrochrome and the binder. There is no teaching in Hill that the density can even approach 99% of theoretical.

For this additional reason, a rejection of claim 1 as being unpatentable over Hill in view of Osaki is not warranted pursuant to the provisions of 35 USC 103.

Claim 1 has also been rejected as being unpatentable over Hill in view of Luk.

Luk teaches that lubricants are commonly used during a compaction process and that this is generally accomplished by either blending a solid lubricant powder with an iron based powder or by spraying a liquid dispersion or solution of the lubricant onto a die cavity surface (external lubrication). Luk teaches that lubrication by means of blending a solid lubricant into the iron-based powder composition has disadvantages. First, the lubricant generally has a density of about 1 to 2 grams per cubic centimeter as compared to the density of the iron-based powder which is about 7 to 8 grams per cubic centimeter. Inclusion of the less dense lubricant in the composition lowers the green

density of the compacted part. Second, internal lubricants are generally not sufficiently effective for reducing the ejection pressures. Finally, when the particles of internal lubricant burn off during sintering, pore spaces can be left in the compacted part, providing a source of weakness for the part. (column 1, lines 32 to 45).

According to Luk, an external lubricant is provided which avoids the problems of reduced green density and sintered strength but which provides uniform lubricity to the die wall and minimizes ejection forces. (column 1, lines 58 to 62). As specifically stated in Luk, the lubricant is generally applied to the walls of a compaction die before the powder composition is charged into the die for subsequent compaction into a metallurgical part. (column 2, lines 52 to 56).

Clearly, there is no teaching in Luk that would motivate one of ordinary skill in the art to modify the process of Hill to incorporate any type of lubricant in the ferrochrome mixture of Hill. The only teaching from Luk that would be applied is to apply an external lubricant to the walls of a compaction die when compacting the ferrochrome/binder powder mixture of Hill. However, this is not pertinent to the claimed process.

For the above reasons, a rejection of claim 1 as being unpatentable over Hill in view of Luk is not warranted pursuant to the provisions of 35 USC 103.

Claims 2 to 10 depend from claim 1 and are believed to be allowable for similar reasons.

The remaining references have been reviewed; however, none is believed to be further pertinent to the claimed process taken alone or in combination.

The application is believed to be in condition for allowance and such is respectfully requested.

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Respectfully submitted,

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